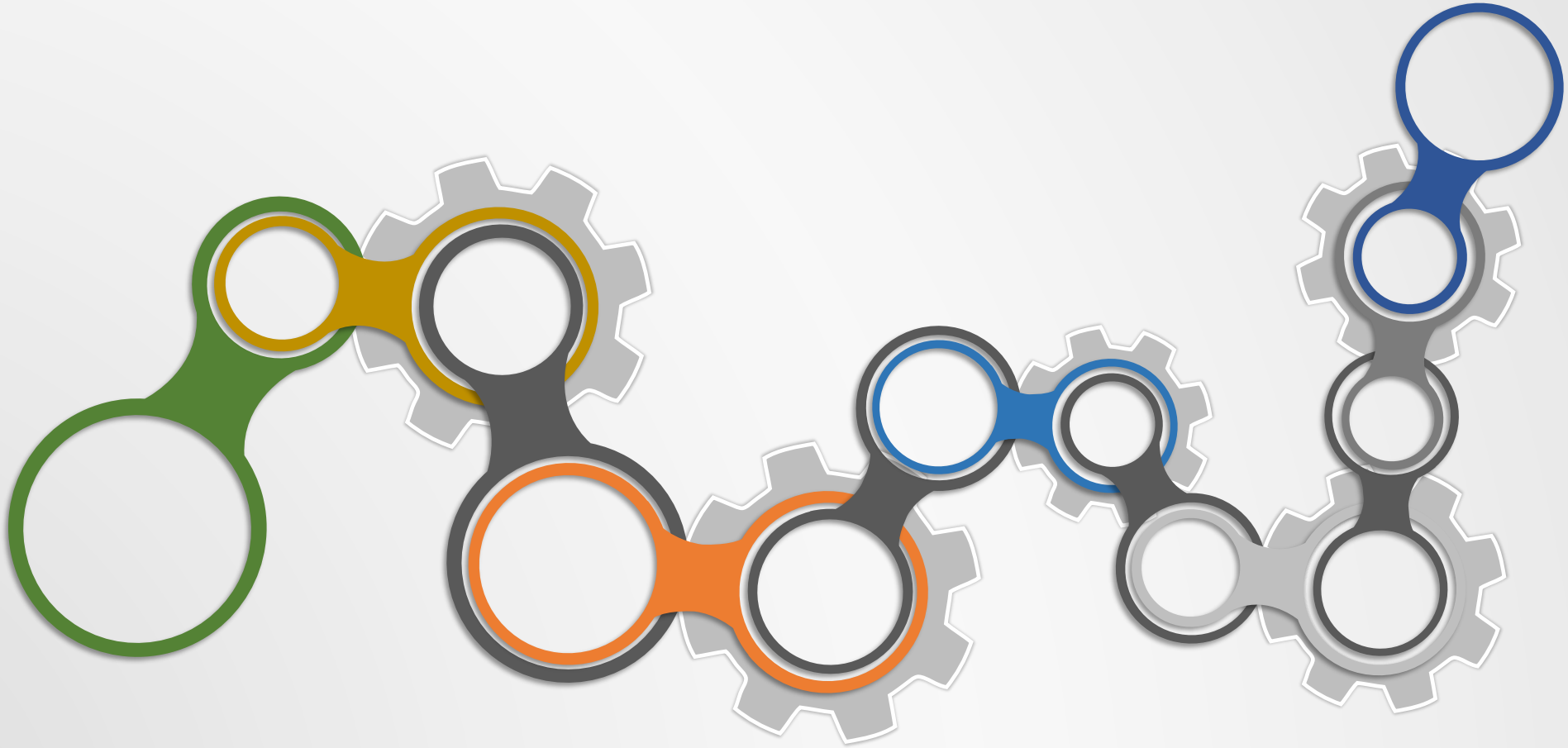
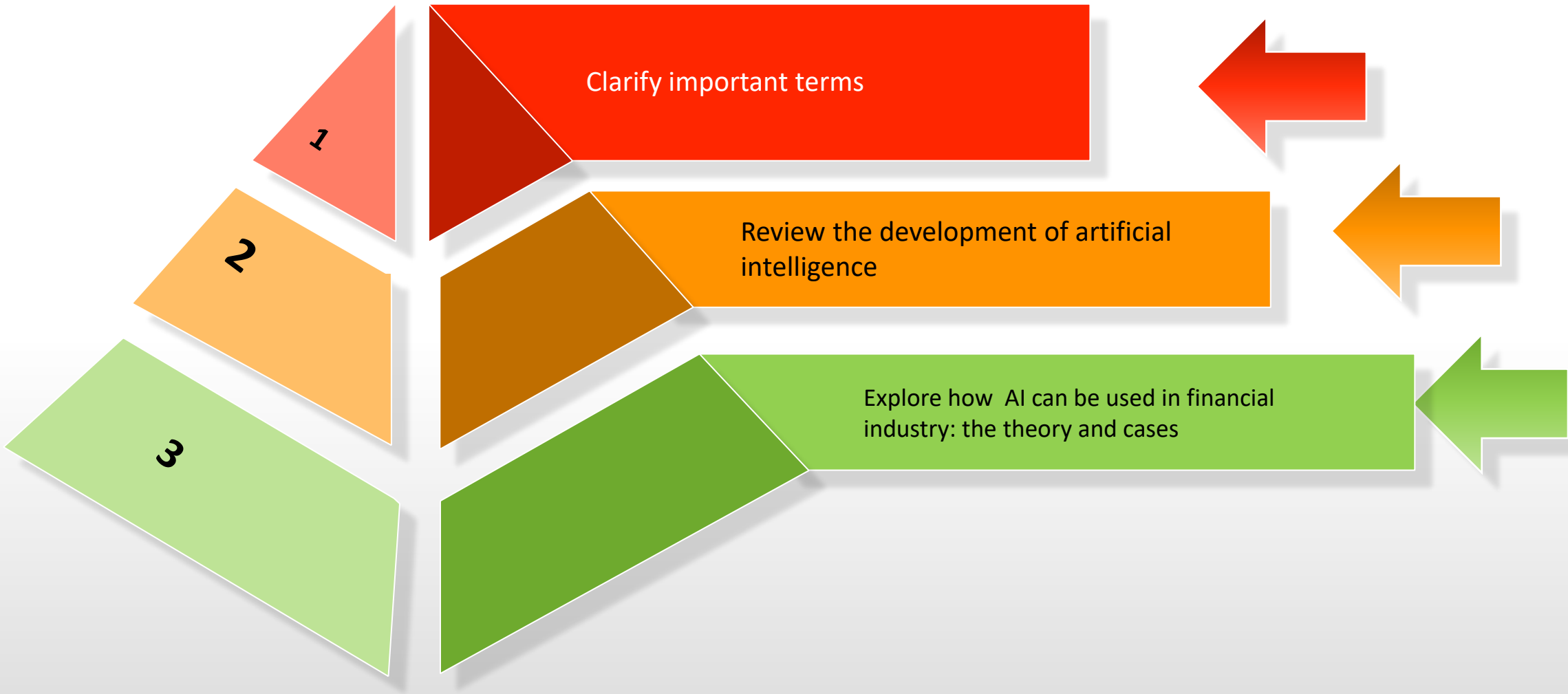
Topic 7 Big Data: Harnessing Data with Artificial Intelligence

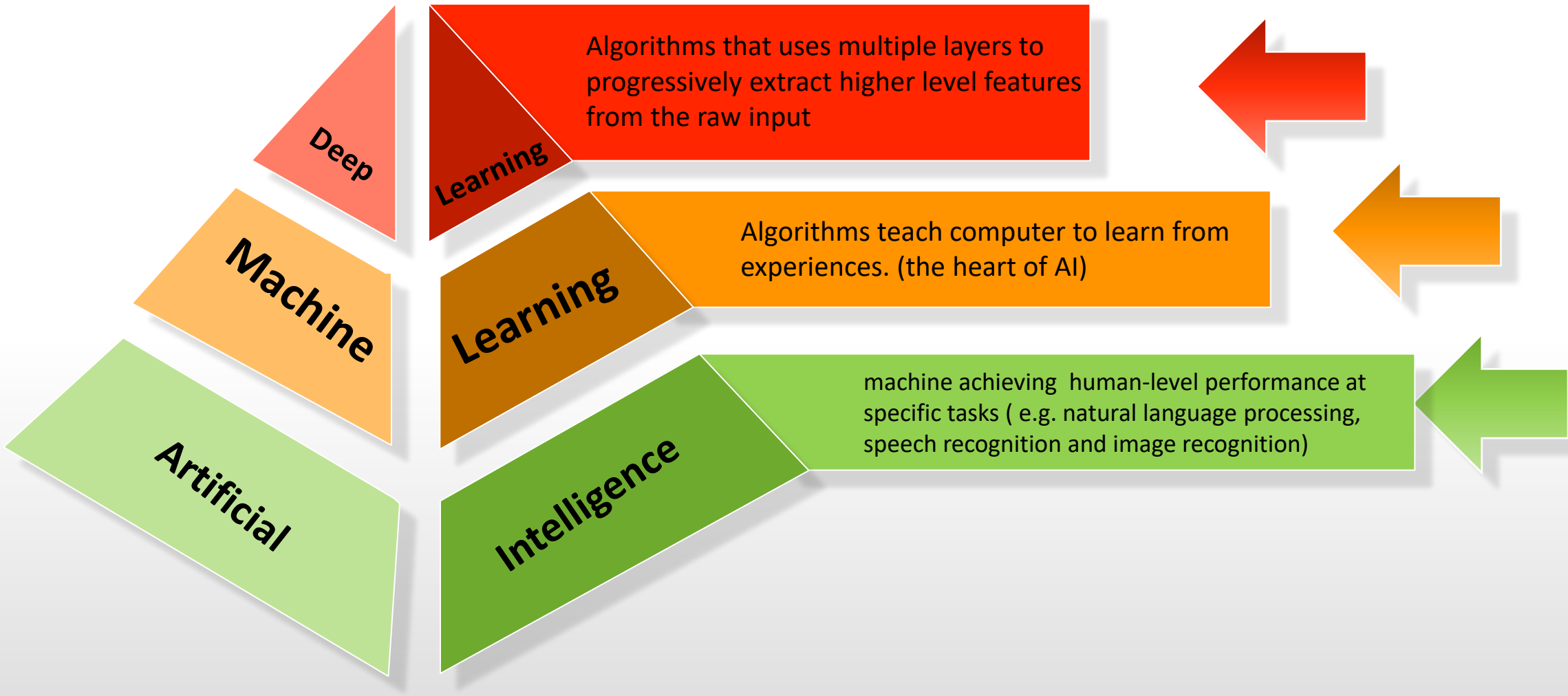
AFIN8014 **FinTech and Innovation**



Learning Objectives



Some Buzzwords



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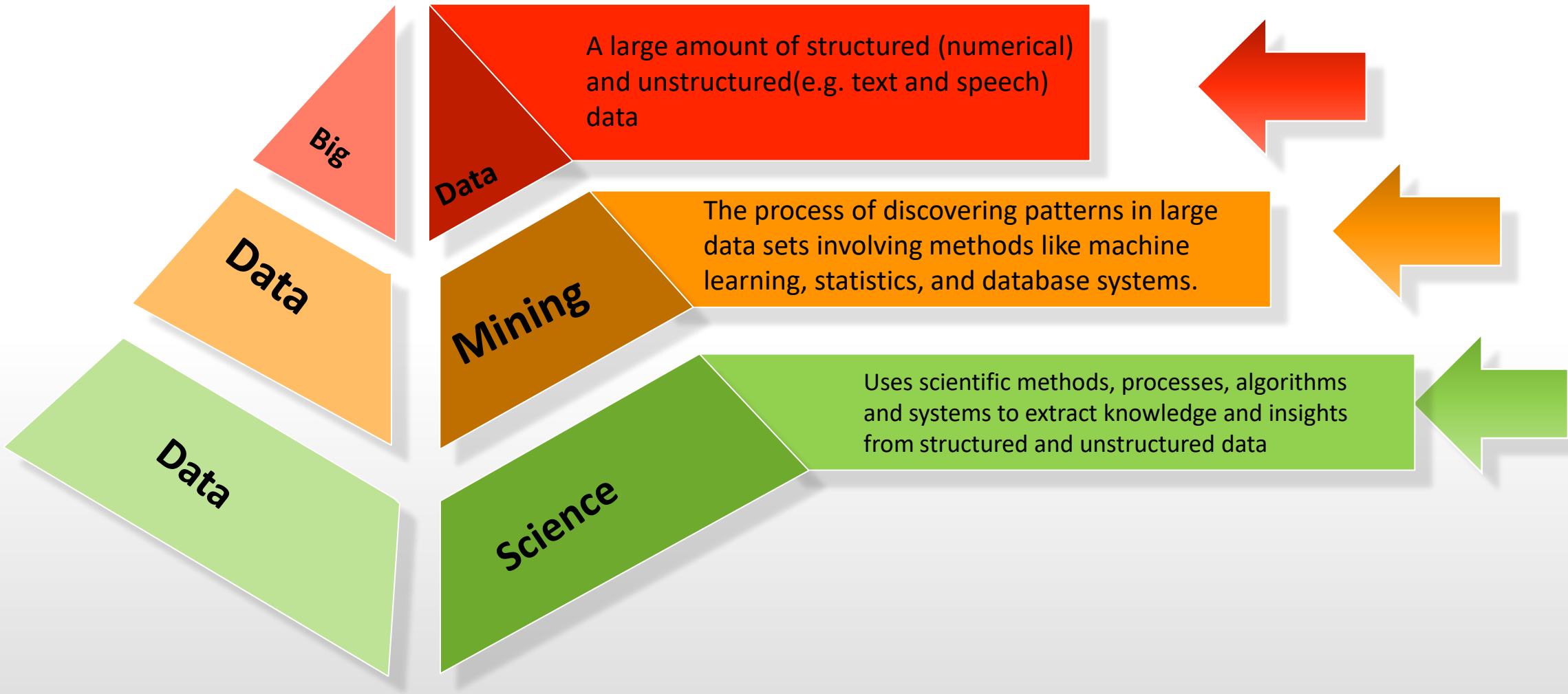
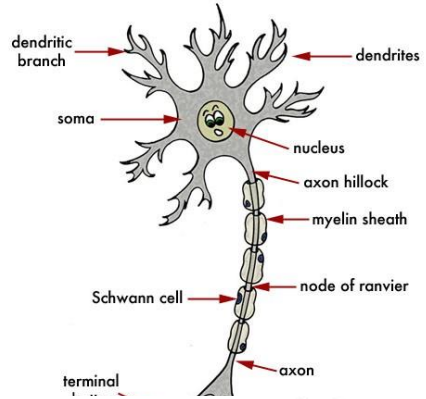
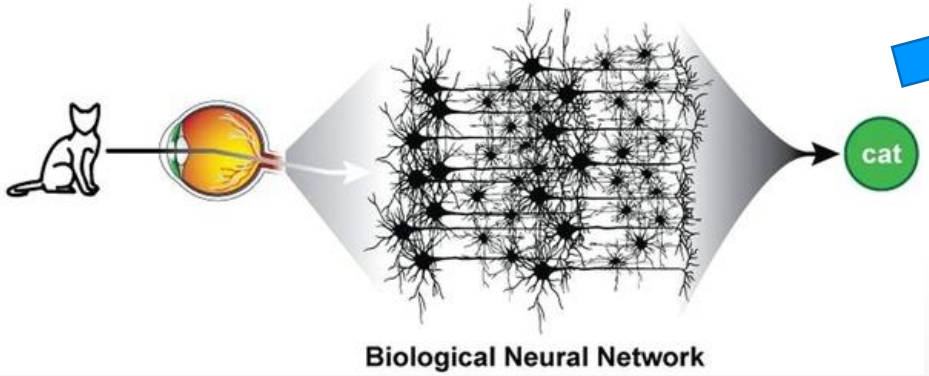
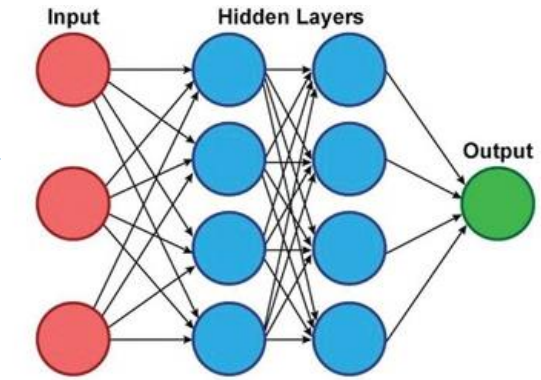


Neural Network: Human v. Artificial



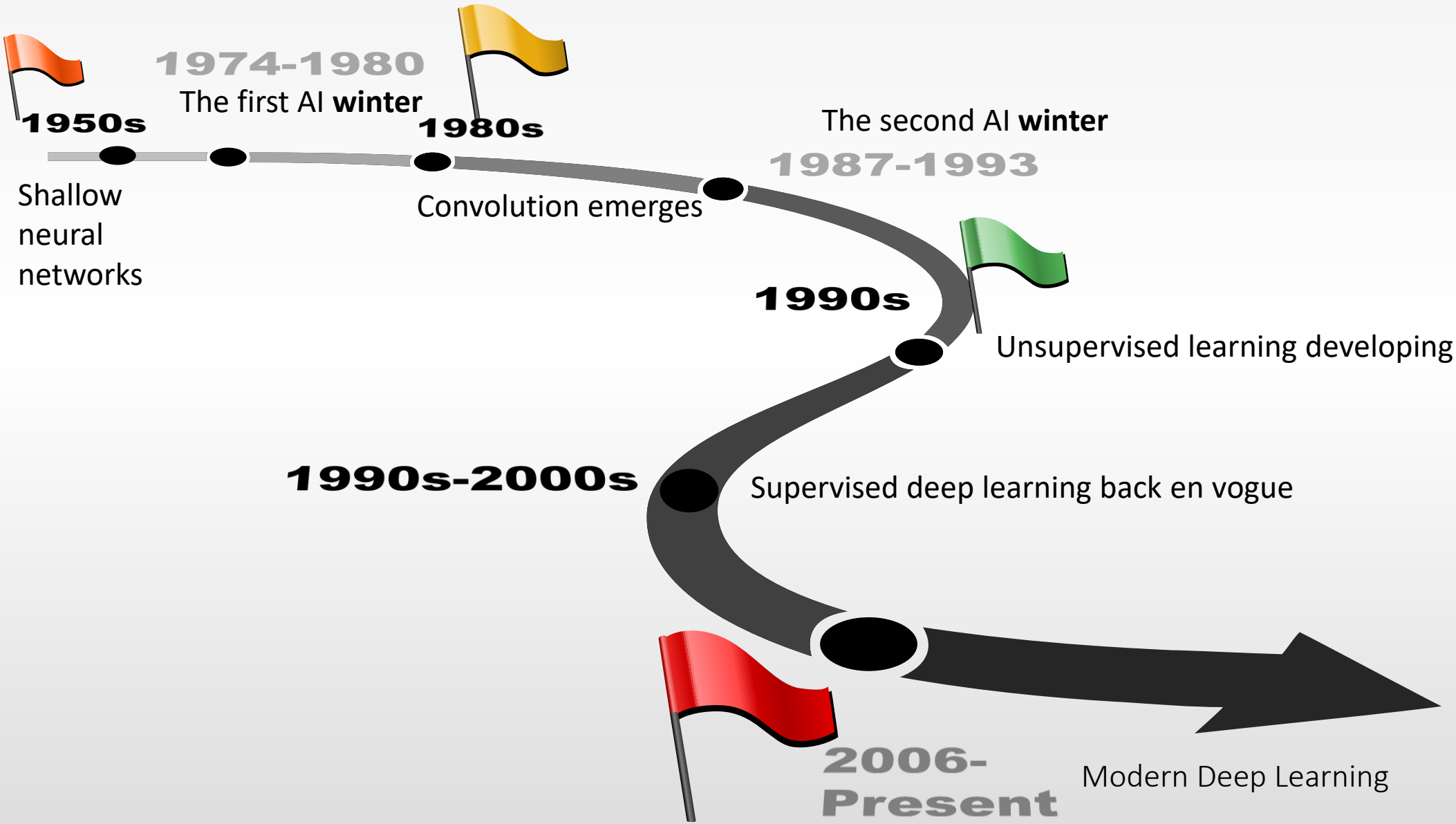


Biological Neural Network



Computer Neural Network

Source: (1) https://www.quora.com/How-is-AI-similar-different-to-the-human-brain
(2) https://www.google.com/url?sa=i&url=https%3A%2F%2Ftowardsdatascience.com%2Funderstanding-neural-networks-22b29755abd9&psig=AOvVaw257oa6jD7wFzL0gNDH5f6f&ust=1586140634828000&source=images&cd=vfe&ved=0CA0QjhxqFwoTCOj17Iqh0OgCFQAAAAAdAAAAABAJ
(3) https://medium.com/predict/artificial-neural-networks-mapping-the-human-brain-2e0bd4a93160


1950s
Shallow neural networks
1974-1980
The first AI winter
1980s
Convolution emerges
The second AI winter
1987-1993
1990s
Unsupervised learning developing
1990s-2000s
Supervised deep learning back en vogue
2006-Present
Modern Deep Learning

The foundation of deep neural networks (DNN).

We ‘ construct an electronic or electromechanical system which would learn to recognize similarities or identities between patterns of optical, electrical, or tonal information, in a manner which may be closely analogous to the perceptual processes of a biological brain’

Frank Rosenblatt, 1957

Frist AI Winter

“in no part of the (AI) field have discoveries made so far produced the major impact that was then promised.”

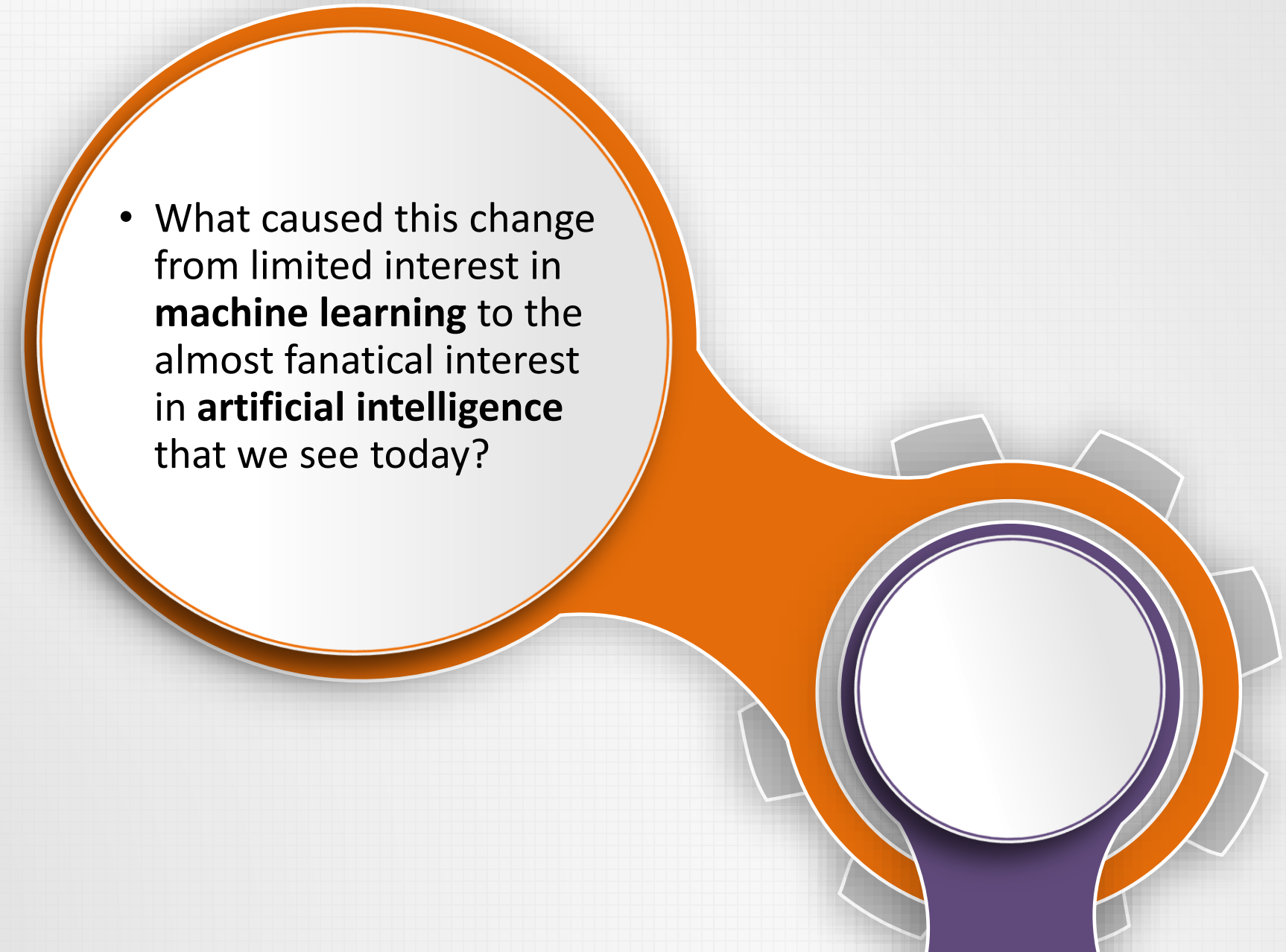
Lighthill report, 1973

Second AI Winter

AI research has always had
“… very limited success in particular areas, followed immediately by failure to reach the broader goal at which these initial successes seem at first to hint…”.

Schwarz, Director of DARPA ISTO 1987

- What caused this change from limited interest in **machine learning** to the almost fanatical interest in **artificial intelligence** that we see today?



2009 – Launch of ImageNet

Overfitting:

- **An obstacles in machine learning**
- **Model learns irregularities from a limited data set**

More Data

IMAGENET

14,197,122 images, 21841 synsets indexed

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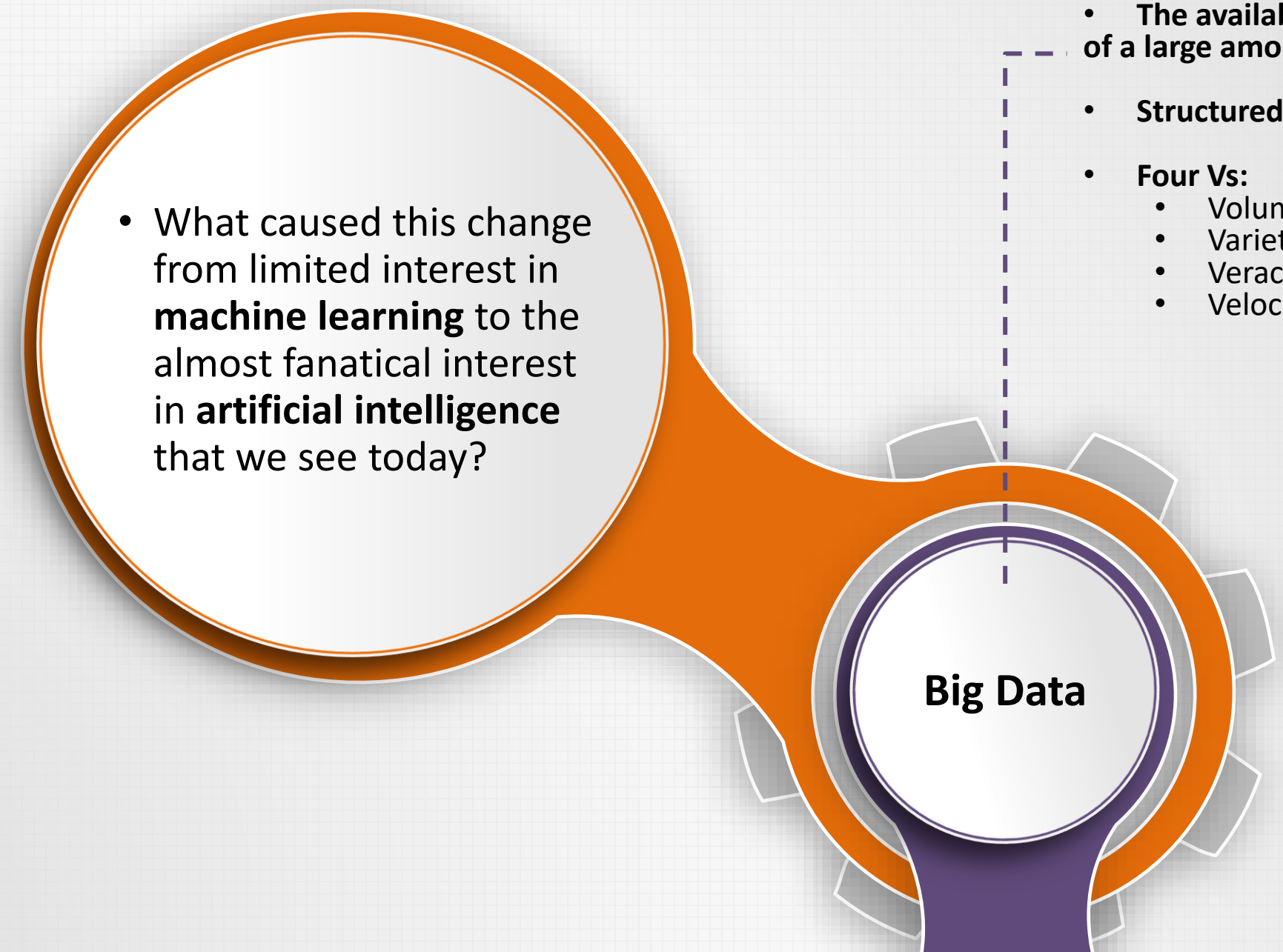
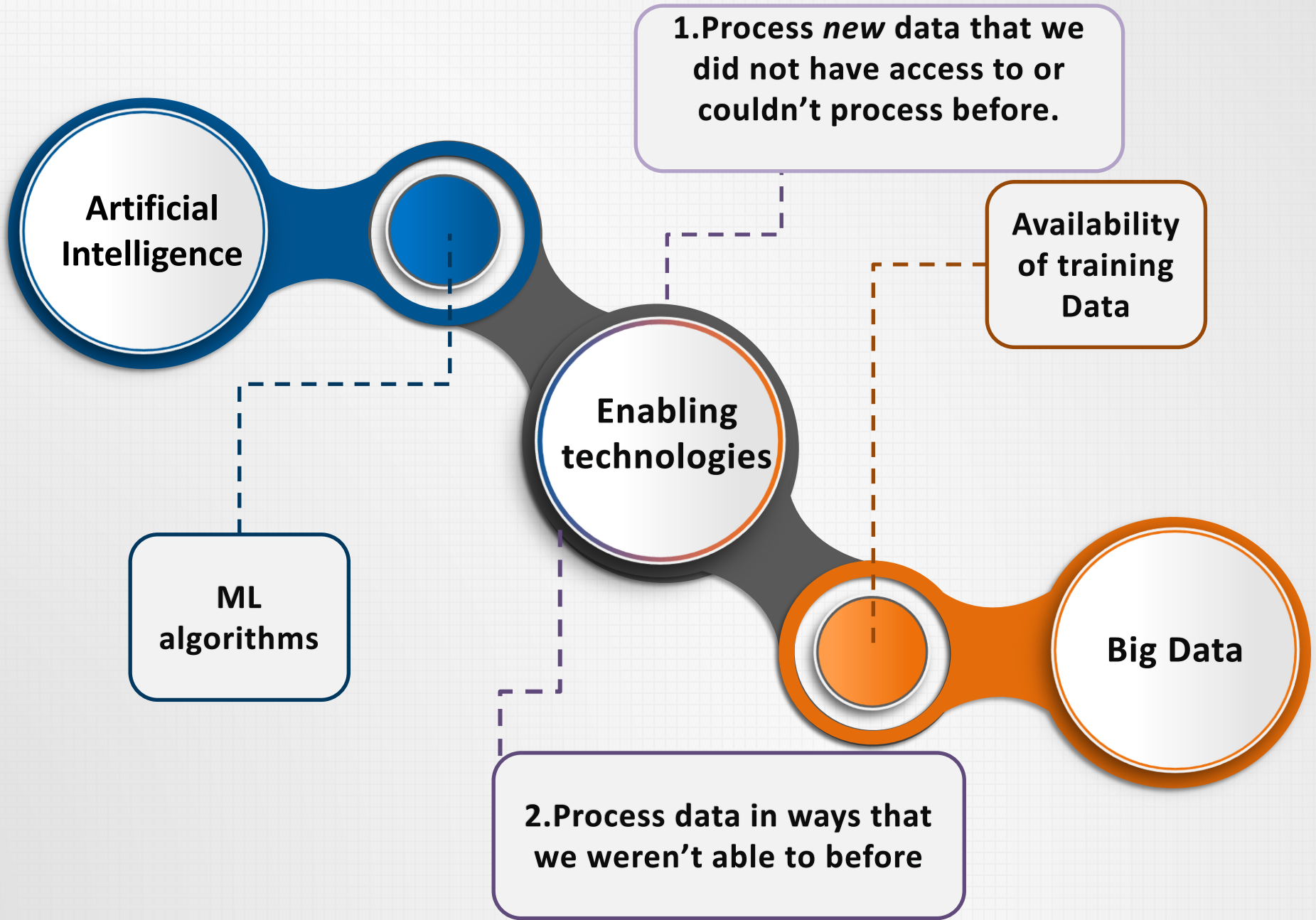


- **The availability of a large amount of training data**
- **Structured/Unstructured Data**
- **Four Vs:**
  - Volume
  - Variety
  - Veracity
  - Velocity

Harness Big Data with AI

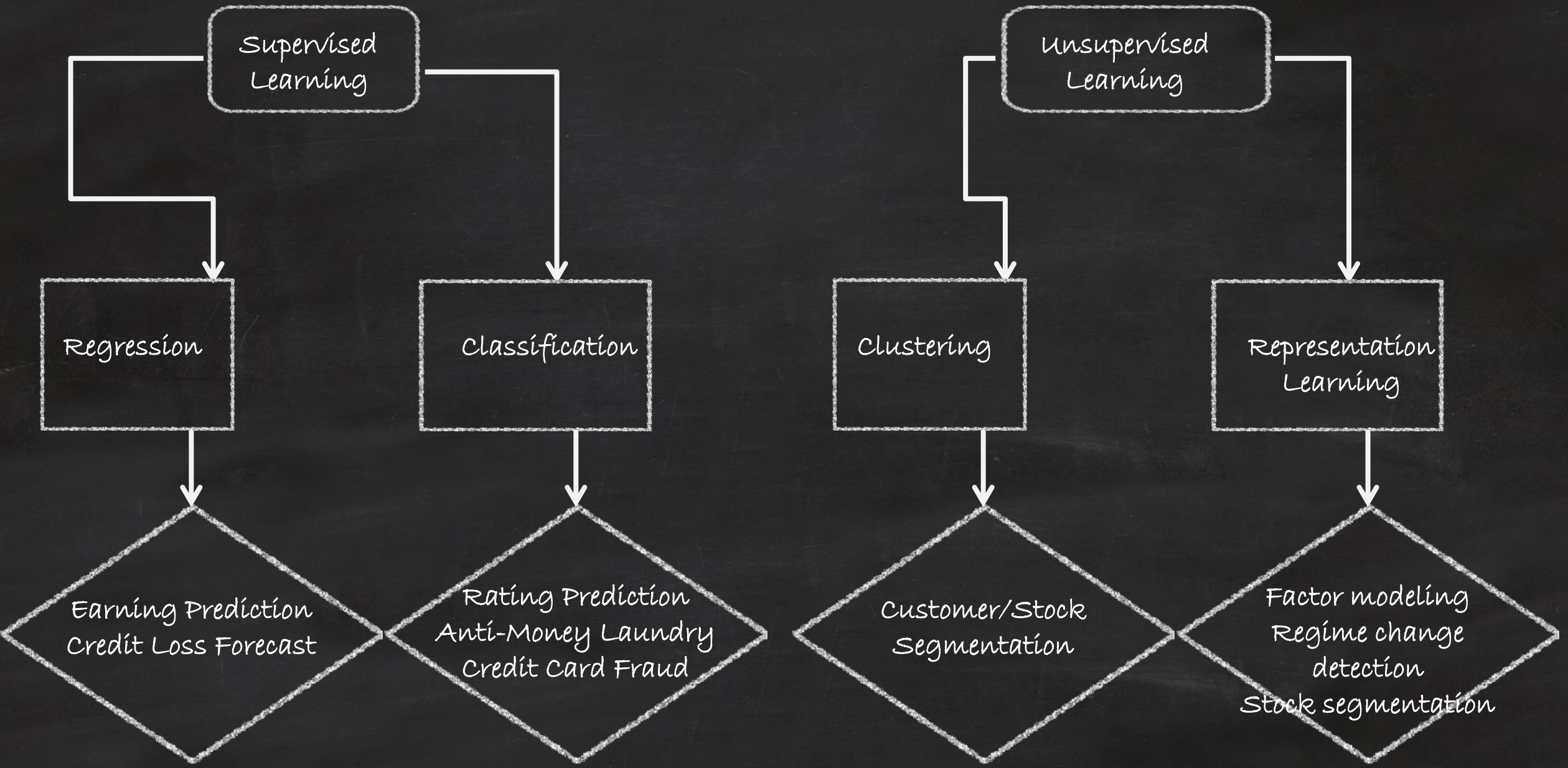


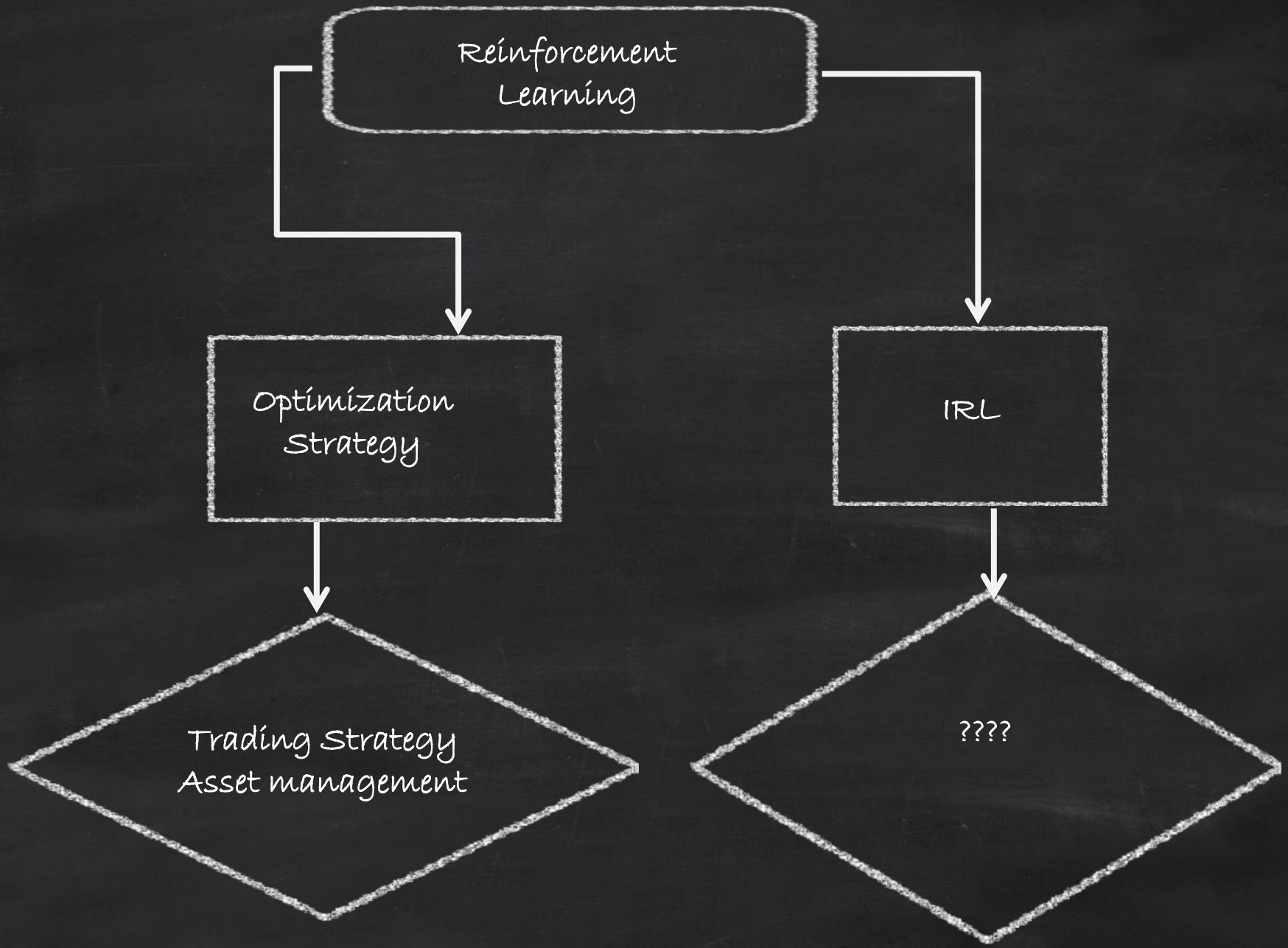
What can AI and big data do in Finance?

Four Types of Financial Data

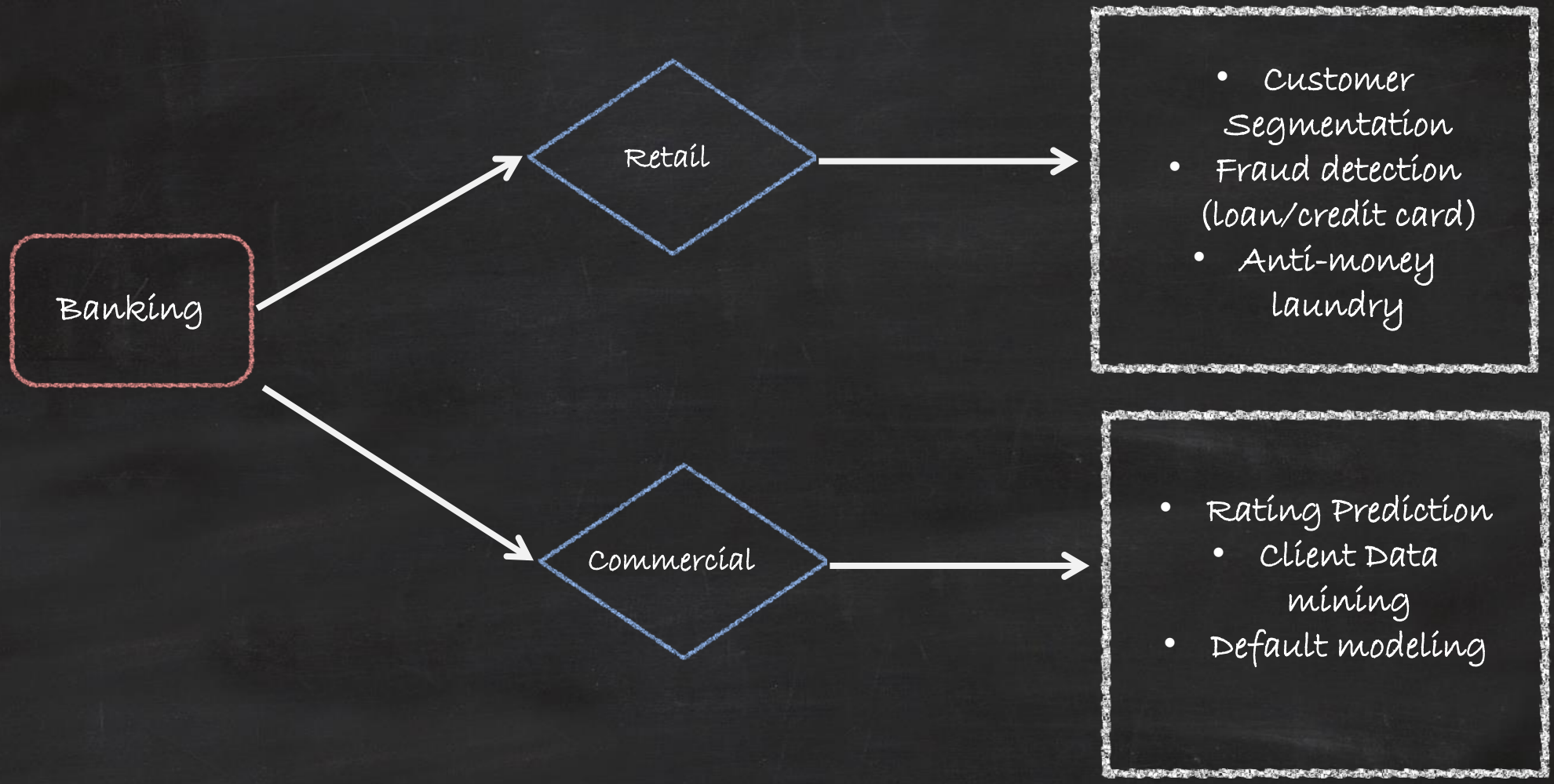
Fundamental Data	Market Data	Analytics	Alternative Data
• Accounting Infor • Assets • Liabilities • Sales • Cost • Profit • Macro Variables • …	• Price • Yield • Volatility • Volume • Quotes • …	• Analyst Recommendations • Forecasted EPS • Credit Ratings • New Sentiments • …	• Satellite Images • Google Searches • Twitter/Chats • Metadata • …

Source: Table is based on Table 2.1 page 24 of <Advances in financial machine learning> by De Prado, 2019

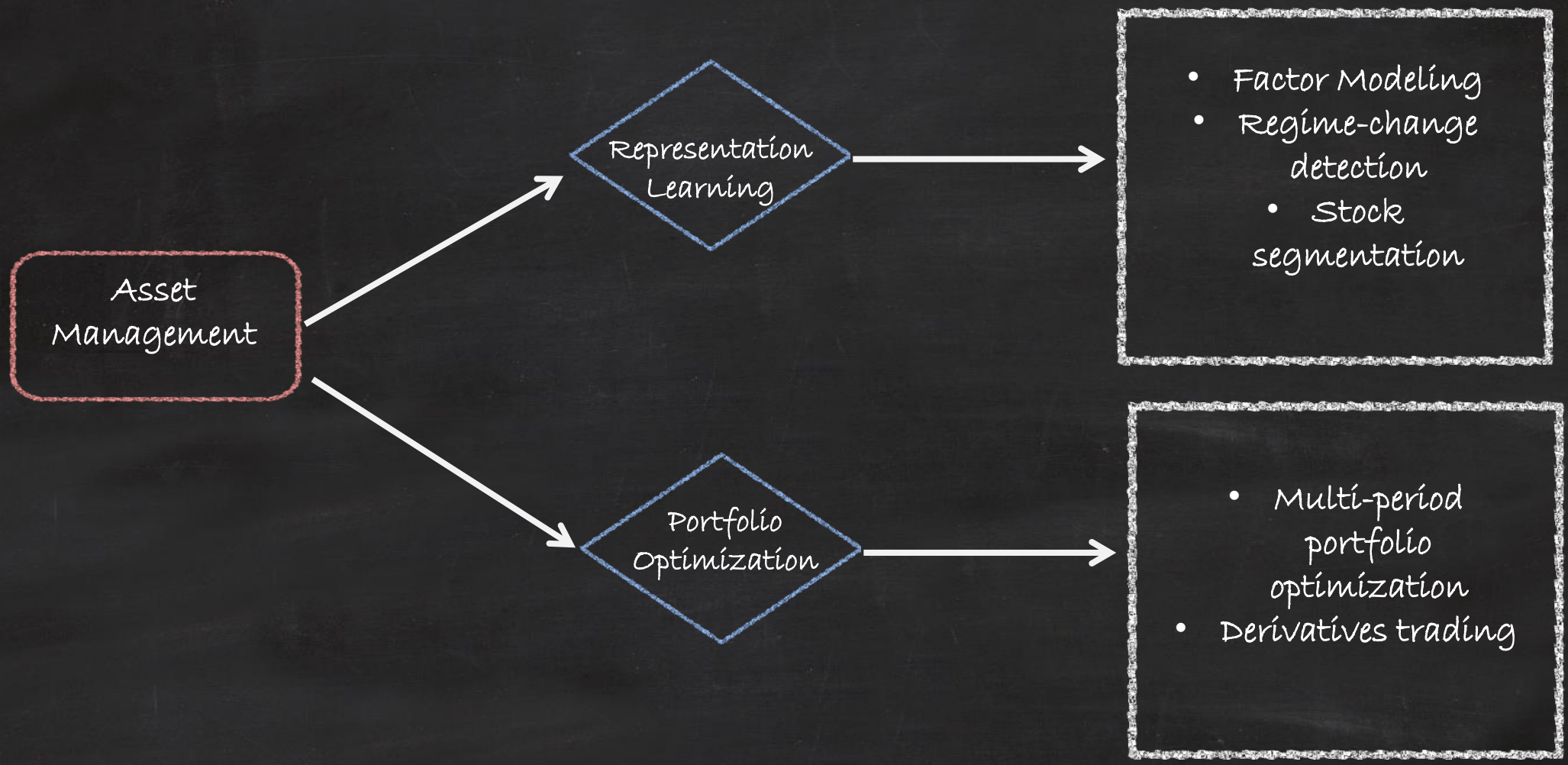

Supervised Learning
Regression
Classification
Earning Prediction
Credit Loss Forecast
Rating Prediction
Anti-Money Laundry
Credit Card Fraud
Unsupervised Learning
Clustering
Representation Learning
Customer/Stock Segmentation
Factor modeling
Regime change detection
Stock segmentation


Reinforcement Learning
Optimization Strategy
IRL
Trading Strategy
Asset management
????

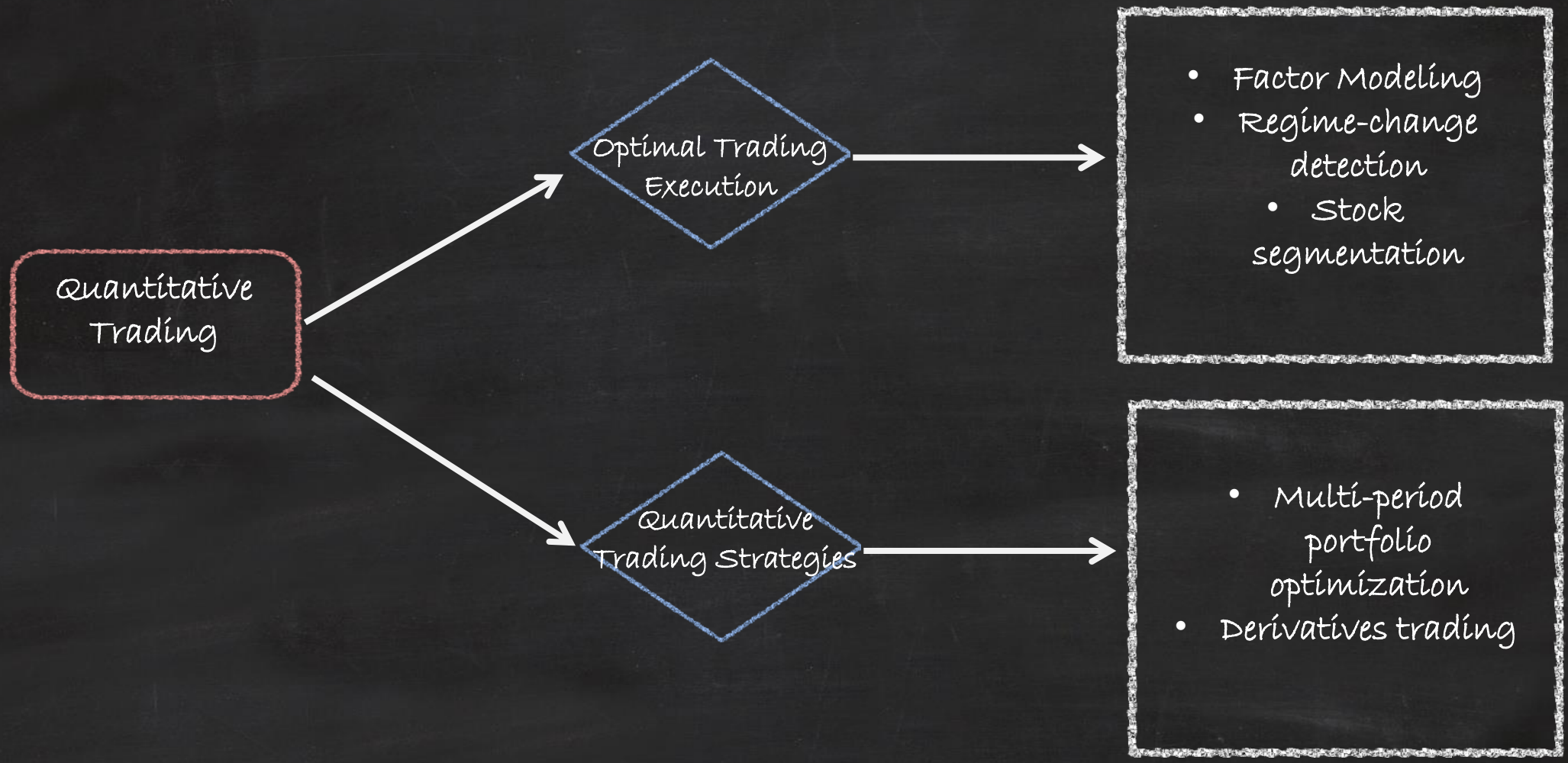
Financial Application Area



Financial Application Area



Financial Application Area



Case: MAN AHL

- https://www.ahl.com/
- Enhancing **trading strategy** and execution with ML

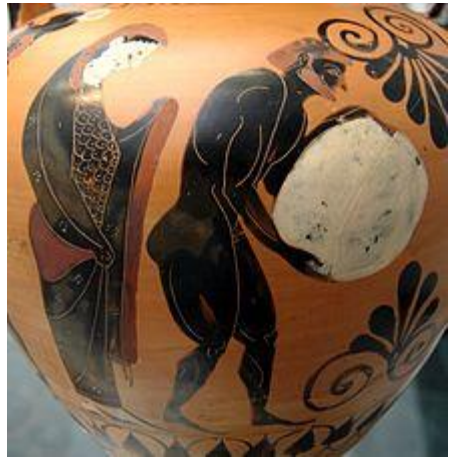
Source : this case are based on ‘AI Pioneers in Investment Management’ CFA institution, 2019

Caveat?

- How to set the parameters properly so that the learning process can capture relationships that might previously have been unknowable.
- A black box effect: how to make sure the deeper analysis yield a **true** window into the relationships between the input and the output?
- Does big data mean better data?
- Will deeper analysis lead to better investment decision?

Why Financial Machine Learning Projects Usually Fail?

The Sisyphus Paradigm

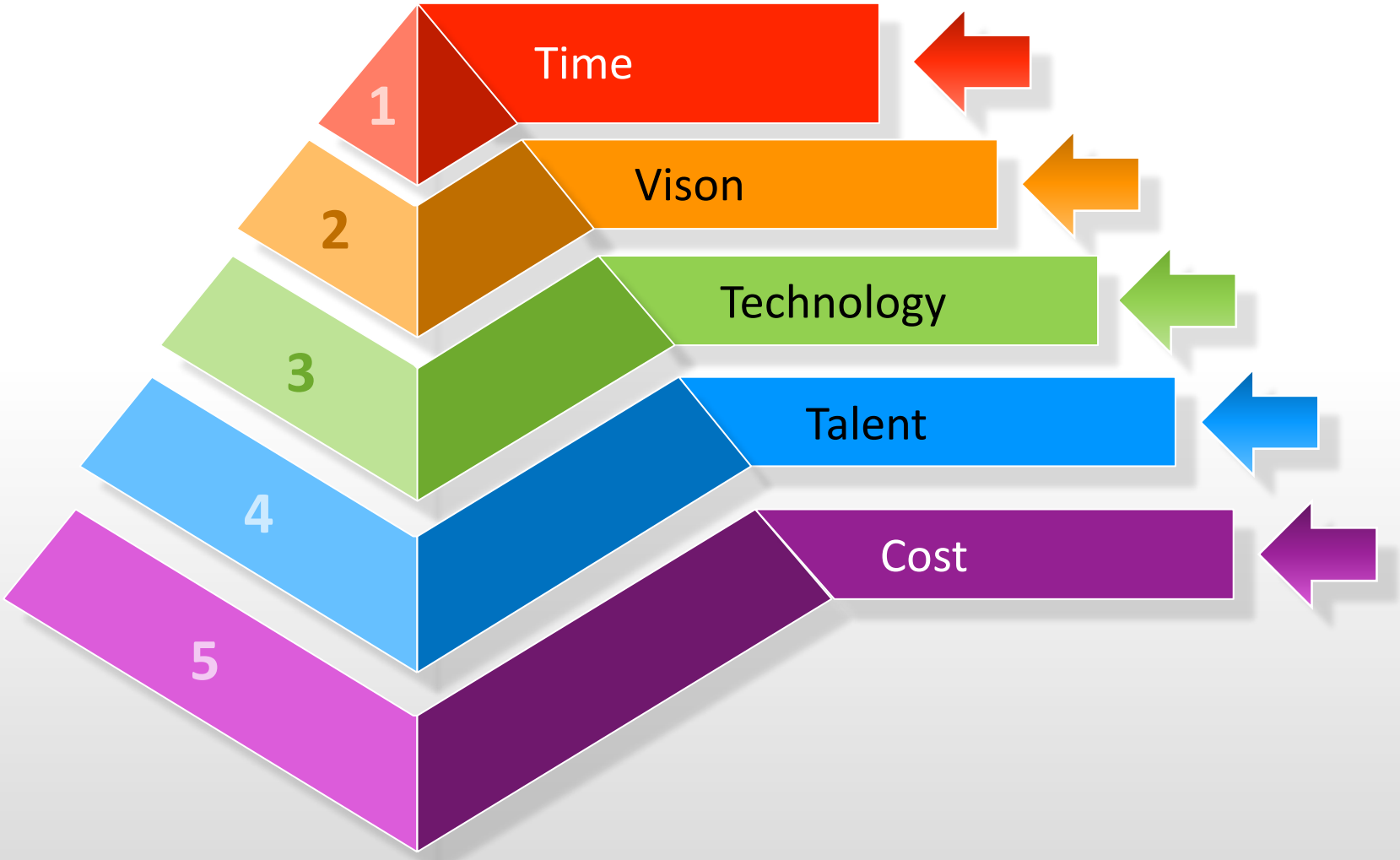


The Meta-Strategy Paradigm

Source : <Advances in financial machine learning> by De Prado, 2019

Challenges in Applying AI and Big Data

The FinTech Pyramid



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